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# A New Species of *Galaxia* (Iridaceae subfamily Iridoideae) from Namaqualand, South Africa

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**ABSTRACT.** *Galaxia fenestralis* is new a species from central interior Namaqualand, Cape Province, South Africa. Apparently most closely related to another Namaqualand endemic, *G. kamiesmontana* Goldblatt, *G. fenestralis* is distinguished by its terete, succulent leaves, and small light pink to mauve or whitish flowers with a yellow center and narrowly clawed tepals. It grows on exposed granite outcrops in virtually no soil, and flowers early in the rainy season, in June and July, a few weeks after the first of the season's rains have fallen.

Comprising some 15 species, including the one described here, *Galaxia* Thunberg is restricted to the winter rainfall region of the southern and western Cape Province, South Africa (Goldblatt 1979a; 1984). A member of subfamily Iridoideae tribe Irideae (Goldblatt, 1991), *Galaxia* is distinguished from the related genera *Moraea* Miller and *Homeria* Ventenat by the absence of an aerial stem and by the cup-shaped flowers borne above the basal cluster of leaves on a short closed perianth tube. Two subgenera are currently recognized in *Galaxia* (Goldblatt, 1979a). Subgenus *Galaxia* comprises species with yellow or white flowers and apomorphic style lobes that are deeply and regularly fringed. In subgenus *Eurystigma* the flowers may be yellow but are more often pink to purple or reddish (also sometimes white), and the style lobes have entire margins, the plesiomorphic state. The new species, *G. fenestralis* (Figure 1), clearly accords with subgenus *Eurystigma* both in flower color and stigma features. Its flowers resemble most closely those of the only other Namaqualand member of the subgenus, *G. kamiesmontana* Goldblatt, in their pale pink to mauve color with a yellow center, small size, and in the rather narrowly clawed tepals. In other species of the subgenus the distinction between tepal limb and claw is obscure if present at all, and the flowers are considerably larger.

Cytologically, subgenus *Eurystigma* is notable for a descending dysploid series. The presumed ancestral basic chromosome number for *Galaxia* is  $x = 9$  (Goldblatt, 1979b, 1984), also the base number for all species of subgenus *Galaxia* and for *G. kamiesmontana*. Other species of subgenus *Eurystigma* have  $n = 8, 7, \text{ or } 6$ . Unfortunately, chromosome number has not been determined for the new species, the only member of the genus for which this information is unknown.

*Galaxia fenestralis* is distinguished by apomorphic nearly terete and succulent leaves with an adaxial band of transparent tissue (Fig. 2A). It is also unique in the genus in having the inner whorl of tepals connate for 2 mm with the filament column (Fig. 1B). Nectaries are present at the base of the outer tepals and can be recognized by their crescent shape and maroon edges (Figure 1B). Nectaries have not been described in other species of *Galaxia* (Goldblatt, 1979a), but perigonal nectaries are typical of tribe Irideae (Goldblatt, 1990) where they commonly occur at the base of the outer tepals, as in *Moraea* and *Iris* (Goldblatt, 1991), or also at the base of the inner tepals. The short-lived flowers, which last from mid-morning when they open until about 3:30 PM, are typical of the genus. Such fugacious flowers are plesiomorphic for subtribe *Homeriinae*, to which *Moraea* and *Homeria* also belong (Goldblatt, 1990, 1991).

The unusual leaves of *Galaxia fenestralis* (Figure 2A) are interesting anatomically. Although nearly terete, they are not centric. The peculiar transparent band on the upper leaf surface lacks chlorenchyma and is continuous with the cortical mesophyll, which is compact and lacks intercellular air spaces, which renders the leaf succulent. The "window" is bordered by single strands of subepidermal sclerenchyma fibers three cell layers thick. Elsewhere the epidermis overlies a palisade mostly of 3 cell layers. The outer walls of the epidermal cells are micro-

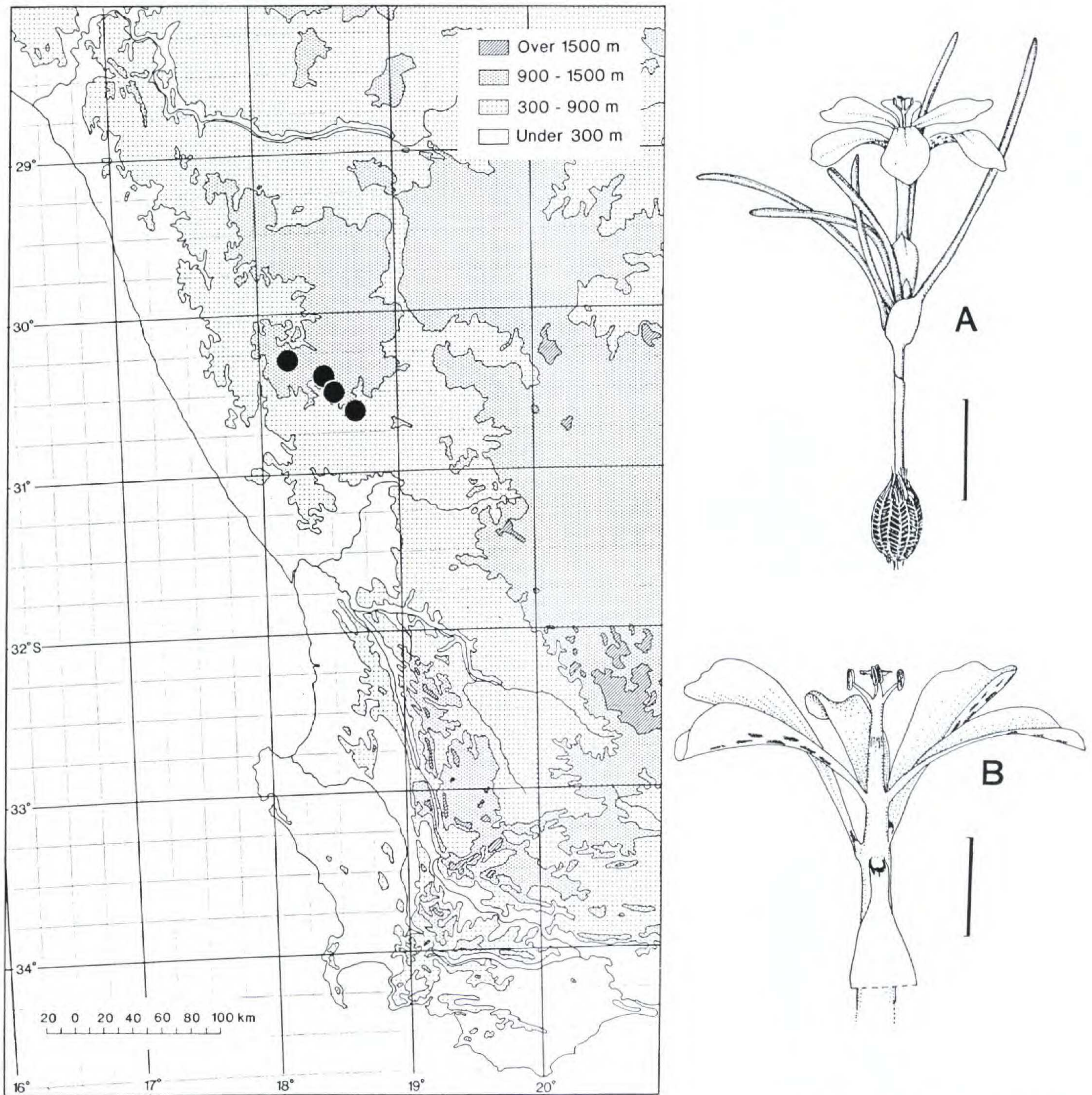


Figure 1. Morphology and distribution of *Galaxia fenestralis*. — A. Whole plant (scale bar = 2.5 mm). — B. Detail of flower with outer tepal bent forward to show basal nectary surrounded by dark pigment and entire filament column (note inner tepals united for a short distance with the filament column) (scale bar = 5 mm). (Drawn by I. Oliver.)

scopically striate, with two striae per cell. The outer walls and cuticle are otherwise unremarkable. Stomata are abundant above the chlorenchyma (absent from the "window"), are not sunken, and communicate with the cortex via substomatal chambers. The vascular bundles are arranged in a ring along the inner edge of the palisade with the xylem internal. A complete parenchymatous outer bundle sheath is present. The cells at the poles, especially at the phloem pole, each contain a single large rhomboidal crystal. The inner sheath is partially sclerified. A sclerenchymatous phloem cap is present on all but the most minor bundles, and an incomplete

xylem cap is found on only the major bundles. The leaf of *Galaxia kamiesmontana*, putatively the closest relative of *G. fenestralis* is similar in its general anatomical features (Figure 2B), but it is much more slender, lacks the adaxial window, and is not succulent.

The leaves of *Galaxia kamiesmontana* and *G. fenestralis* are typical of malacophyllous xeromorphs in their more or less terete shape with vascular bundles arranged in a cylinder, their compact mesophyll, and relatively greater amount of photosynthetic tissue in relation to the amount of exposed leaf surface (Eames & McDaniels, 1925). The abun-

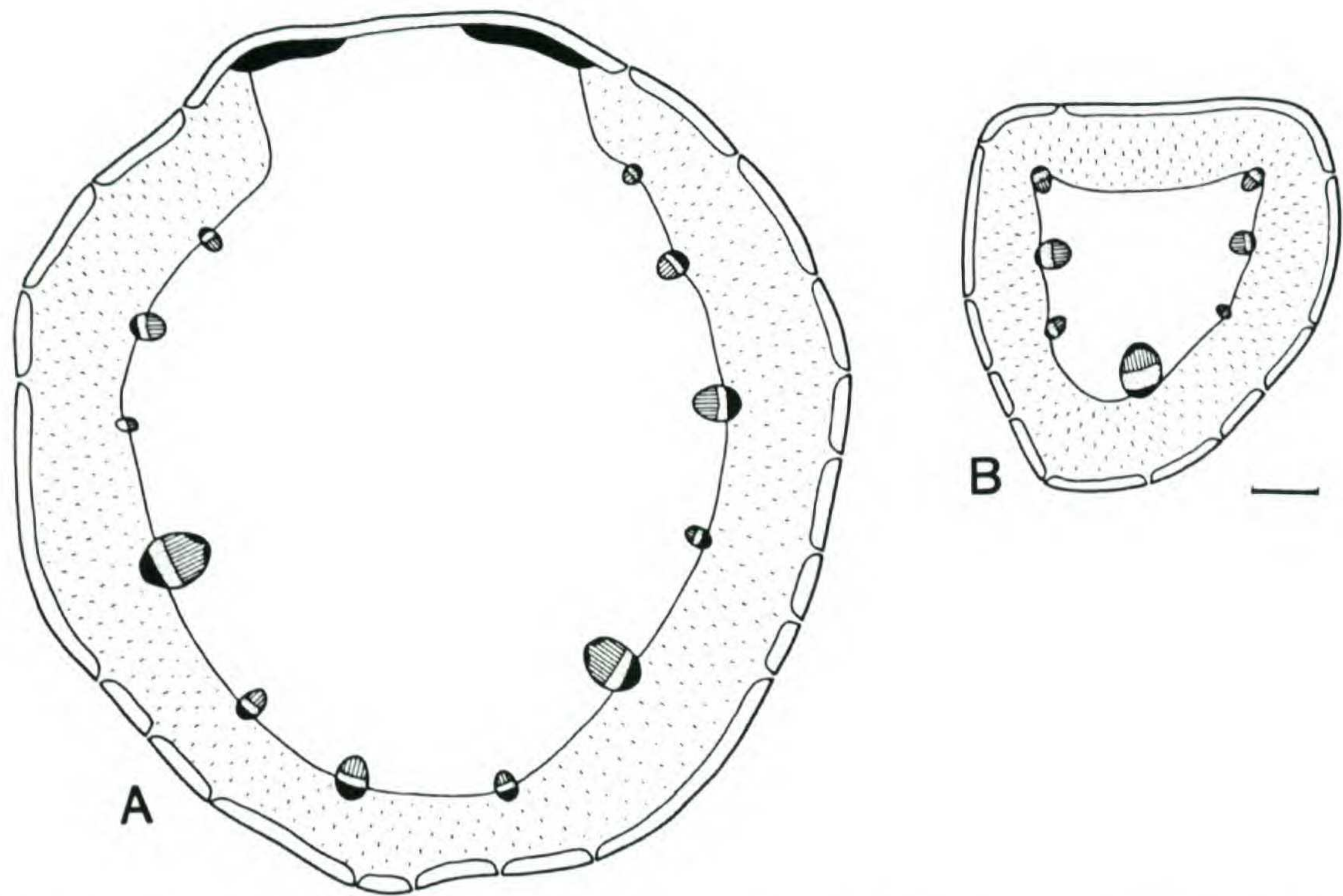


Figure 2. Leaf anatomy of *Galaxia fenestralis* (A) and closely related *G. kamiesmontana* (B) (scale bar 0.1 mm). (Drawn by J. C. Manning.)

dant surface stomata, unremarkable epidermis, and thin cuticle argue against significant drought tolerance. In *G. fenestralis* the strategy of maximizing photosynthetic tissue while minimizing surface area is apparently developed further through enhancing light utilization by the photosynthetic window which permits light to penetrate into the center of the leaf. This is presumably a strategy to enable rapid growth in the short period when water is available each growing season, followed by drought avoidance through geophytism.

***Galaxia fenestralis*** Goldblatt & E. G. H. Oliver, sp. nov. TYPE: South Africa. Cape Province: 3018 (Kamiesberg) Kliprand District, valley northwest of Matjesfontein towards Middelpoos, sandy seep on low granite outcrop, 960 m, 27 June 1991 (DA), *Oliver 9847* (holotype, STE; isotypes, K, MO, PRE) (Figure 1).

Plantae parvae, ad 2.5 cm altae, foliis productis 3–4, laminis teretibus falcatis succulentis 10–35 × 0.6–1 mm, floribus cupuliformibus pallidis carneis ad malvinis vel albescentibus centris luteis, tubo perianthii ca. 8 mm longo, tepalis unguiculatis ca. 15 mm longis, unguibus tepalorum interiorum ad columnam filamentorum connatis, limbis patentibus, filamentis ca. 7 mm longis in columnam connatis supra divergentibus, antheris ca. 2 mm longis, stylo diviso prope medium antherorum, marginibus stigmatum integris undulatis.

Plants small, to 2.5 cm high. *Corm* ± ovoid, 6–8 mm diam., the tunics light brown, composed of reticulate fibers with prominent vertical ribs. *Foliage*

*leaves* 3–4 per plant, blades terete, falcate, succulent, 10–35 × 0.6–1 mm, with a transparent adaxial band, the sheaths broad and transparent. *Stem* subterranean but in fruit reaching shortly above the ground. *Flowers* actinomorphic, cuplike, pale pink to lilac (or whitish) with a yellow center; *perianth tube* ca. 8 mm long, cylindrical; *tepals* ca. 15 mm long, unguiculate, the inner 3 tepals joined to the filament column for ca. 2 mm, tepal claws ascending, ca. 6 mm long, the limbs spreading, ca. 6 mm long. *Filaments* ca. 7 mm long, united for the lower 6 mm in a cylindrical column (connate for 2 mm with the inner tepals), free and diverging above; *anthers* ca. 2 mm long, erect, yellow. *Ovary* ca. 4 mm long; *style* slender, reaching to about mid anther level, there diverging into 3 lobes, these with entire, undulate margins. *Capsules* ovoid-ellipsoid, ca. 6 mm long; *seeds* ± globose, ca. 0.6 mm diam., dark brown.

Flowering June but depending on the advent of rain (probably until mid July); flowers normally opening ca. 10:00 hr. and collapsing ca. 15:30 hr.

*Distribution and habitat.* *Galaxia fenestralis* is endemic to the eastern Kamiesberg Mountains of central Namaqualand and to the lower hills of the interior in the Kliprand District (Figure 1). It was discovered only in 1990 and its entire range remains to be demonstrated. Like the apparently closely related *G. kamiesmontana*, *G. fenestralis* favors rocky habitats where it grows in shallow sandy soil on exposed granite outcrops. It flowers at the beginning

of the wet season when these sites remain damp for a few weeks and are sometimes waterlogged. In this basically very extreme habitat, which may dry out rapidly in warm weather, we surmise that the succulent leaves store enough water to permit plants to survive periodic desiccation of their habitat. The transparent adaxial window may serve as a means to increase light penetration into the inner tissues of the leaf so that photosynthesis is enhanced during the short periods when moisture conditions permit this to occur.

*Paratypes.* SOUTH AFRICA. **Cape:** 3018 (Kamiesberg) Leliefontein Communal Area, valley southeast of Gooimanskraal between Paulshoek and Nourivier, shallow sand in seep on granite sheets, 1,130 m, 28 June 1991 (AC), *Oliver 9858* (STE); Platbakkies, plateau northwest of Banke, seeps and damp sand on granite sheets, 1,100 m, 28 June 1991 (AD), *Oliver 9852* (PRE, STE); Kliprand District, between Wabreek and Middelpoos, 1,080 m, 27 June 1991 (BC), *Oliver 9849* (STE); hill slopes 4 km southwest of Kliprand, on Rietmond road, south-facing granite slabs, 960 m, 27 June 1991, *Oliver 9846* (STE); 7.5 km southeast of Kliprand on Kamas road, south-facing slopes on granite, 840 m, 5 July 1990 (fr), *Oliver*

*9510* (STE), 27 June 1991 (DB), *Oliver 9844* (MO, PRE, STE).

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#### Literature Cited

- Eames, A. J. & L. H. McDaniels. 1925. *An Introduction to Plant Anatomy*. McGraw Hill, New York.
- Goldblatt, P. 1979a. Biology and systematics of *Galaxia* (Iridaceae). *J. S. African Bot.* 45: 385-423.
- . 1979b. Chromosome cytology and karyotype change in *Galaxia* (Iridaceae). *Pl. Syst. Evol.* 133: 61-69.
- . 1984. New species of *Galaxia* (Iridaceae) and notes on cytology and evolution in the genus. *Ann. Missouri Bot. Gard.* 71: 1082-1087.
- . 1990. Phylogeny and classification of Iridaceae. *Ann. Missouri Bot. Gard.* 77: 607-627.
- . 1991. An overview of the systematics, phylogeny and biology of the southern African Iridaceae. *Contrib. Bolus Herb.* 13: 1-74.